

OXIDIZED TANTALUM NITRIDE AS AN IMPROVED HARDMASK IN DUAL- DAMASCENE PROCESSING

Abstract

A method of producing an oxidized tantalum nitride (TaO_xN_x) hardmask layer for use in dual-damascene processing is described. Fine-line dual-damascene processing places competing, conflicting demands on the hardmask. Whereas critical dimension control needs a thicker hardmask, optical lithographic alignment is frustrated by the opacity of thick tantalum nitride (TaN). The technique solves the problem of TaN hardmask opacity with increasing thickness by oxidizing the TaN layer. Oxidation of the TaN hardmask increases the thickness of the hardmask to two to four times its original thickness and simultaneously increases its transparency by greater than ten times. This permits better CD control associated with a thicker hardmask while facilitating optical lithographic alignment.